

CLAIMS

- 1 1. A method of handing off a session from a first access technology to a second
2 access technology based on a quality of service metric, including:
- 3 monitoring at a mobile terminal, during a session, a quality of service metric
4 describing a connection via a first access technology, the first access technology
5 including a first entity having an IP stack;
- 6 initiating a connection via a second access technology upon the monitored quality
7 of service metric crossing a threshold, while continuing the connection via the
8 first access technology, wherein the second access technology utilizes a different
9 physical layer than the first access technology and includes a second entity
10 having an IP stack;
- 11 signaling the first entity to conduct a hand off of the session with the second
12 entity; and
- 13 modifying routing tables at the mobile terminal to use the connection via the first
14 access technology to continue the session.
- 1 2. The method of claim 1, including further monitoring the quality of service
2 metric while initiating the connection via the second access technology and
3 determining based upon the further monitoring whether to proceed with signaling the
4 first entity.
- 1 3. The method of claim 1, including further monitoring the quality of service
2 metric after initiating the connection via the second access technology and
3 determining based upon the further monitoring whether to proceed with signaling the
4 first entity.
- 1 4. The method of claim 1, wherein the threshold is a connect threshold, based on
2 when it is preferred to connect to the second access technology.
- 1 5. The method of claim 1, wherein the threshold is a disconnect threshold, based
2 on when it is preferred to disconnect from the first access technology.

- 1 6. The method of claim 1, wherein the quality of service metric includes a signal
2 to noise ratio.
- 1 7. The method of claim 1, wherein the quality of service metric includes a bit
2 error rate.
- 1 8. The method of claim 1, wherein the quality of service metric includes a
2 packet loss rate.
- 1 9. The method of claim 1, wherein the quality of service metric includes a frame
2 loss rate.
- 1 10. The method of claim 1, wherein the quality of service metric includes a
2 measure of network congestion.
- 1 11. The method of claim 1, wherein the quality of service metric includes a
2 measure of network transmission delay.
- 1 12. The method of claim 1, wherein the quality of service metric includes cost of
2 access via the first access technology and the second access technology.
- 1 13. The method of claim 1, wherein the quality of service metric includes service
2 available when using the first access technology and the second access
3 technology.
- 1 14. The method of claim 1, wherein the quality of service metric includes security
2 available when using the first access technology and the second access
3 technology.
- 1 15. The method of claim 1, wherein the first access technology is compliant with
2 any 802.11x standard.
- 1 16. The method of claim 1, wherein the first access technology includes using an
2 unlicensed 2.4 GHz network.
- 1 17. The method of claim 1, wherein the first access technology is compliant with
2 any Bluetooth standard.

- 1 18. The method of claim 1, wherein the first access technology includes using an
2 RF connection compliant with any Bluetooth standard.
- 1 19. The method of claim 1, wherein the session is a TCP session.
- 1 20. The method of claim 1, wherein the session is a UDP session.
- 1 21. The method of claim 1, wherein the session is a WAP session.
- 1 22. The method of claim 1, wherein the session includes a Bluetooth standard
2 compliant transport session.
- 1 23. The method of claim 1, wherein the connection via the second access
2 technology is a PPP connection.
- 1 24. The method of claim 1, wherein the second access technology is compliant
2 with an IS 95b standard.
- 1 25. The method of claim 1, wherein the second access technology is compliant
2 with an enhanced GSM standard.
- 1 26. The method of claim 1, wherein the second access technology is compliant
2 with a GPRS standard.
- 1 27. The method of claim 1, wherein the second access technology is compatible
2 with access via Metricom.
- 1 28. The method of claim 1, wherein the second access technology is made using a
2 cellular telephone network.
- 1 29. The method of claim 1, wherein the second access technology is made using
2 an unlicensed 2.4 GHz network.
- 1 30. The method of claim 1, wherein the second access technology is made using
2 communication between a satellite and the mobile terminal for at least one
3 direction of the second access technology connection.
- 1 31. The method of claim 1, wherein the second access technology is compliant
2 with any Bluetooth standard.

- 1 32. The method of claim 1, wherein the second access technology includes using
2 an RF connection compliant with any Bluetooth standard.
- 1 33. The method of claim 1, wherein crossing the threshold involves the signal
2 quality metric rising above the threshold.
- 1 34. The method of claim 1, wherein crossing the threshold involves the signal
2 quality metric dropping below the threshold.
- 1 35. The method of claim 1, wherein crossing the threshold involves the signal
2 quality metric reaching the threshold.
- 1 36. The method of claim 1, wherein the routing table at the mobile terminal is
2 kept in a system directory file.

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1 37. The method of claim 1, wherein the routing table at the mobile terminal is
2 kept in a memory.

1 38. The method of claim 1, wherein modifying the routing table at the mobile
2 terminal includes updating the default interface.

1 39. The method of claim 1, wherein modifying the routing table at the mobile
2 terminal includes updating the default IP address.

1 40. The method of claim 1, wherein signaling takes place before modifying.

1 41. The method of claim 1, wherein modifying takes place before signaling.

1 42. A method of handing off a session from a WLAN connection to a WWAN
2 connection based on a signal quality metric, including:

3 monitoring at a mobile terminal during a session a signal quality metric
4 describing a connection to a WLAN;

5 initiating a connection to a WWAN upon the signal quality metric crossing a
6 disconnect threshold, while continuing the connection to the WLAN;

7 signaling a first access router to conduct a hand off of the session with a second
8 access router; and

9 modifying routing tables at the mobile terminal to use the WWAN connection to
10 continue the session.

43. The method of claim 42, including further monitoring the signal quality
metric while initiating the connection to the WWAN and determining based upon the
further monitoring whether to proceed with signaling the first access router.

1 44. The method of claim 42, including further monitoring the signal quality
2 metric after initiating the connection to the WWAN and determining based upon the
3 further monitoring whether to proceed with signaling the first access router.

1 45. The method of claim 42, wherein the signal quality metric is a signal to noise
2 ratio.

- 1 46. The method of claim 42, wherein the signal quality metric is a bit error rate.
- 1 47. The method of claim 42, wherein the signal quality metric is a packet loss
2 rate.
- 1 48. The method of claim 42, wherein the signal quality metric is a frame loss rate.
- 1 49. The method of claim 42, wherein the signal quality metric is a measure of
2 network congestion.
- 1 50. The method of claim 42, wherein the signal quality metric is a measure of
2 network transmission delay.
- 1 51. The method of claim 42, wherein the WLAN connection is compliant with
2 any 802.11x standard.
- 1 52. The method of claim 42, wherein the WLAN connection is made using an
2 unlicensed 2.4 GHz network.
- 1 53. The method of claim 42, wherein the session is a TCP session.
- 1 54. The method of claim 42, wherein the session is a UDP session.
- 1 55. The method of claim 42, wherein the connection to the WWAN is a PPP
2 connection.
- 1 56. The method of claim 42, wherein the WWAN connection is compliant with
2 an IS 95b standard.
- 1 57. The method of claim 42, wherein the WWAN connection is compliant with
2 an enhanced GSM standard.
- 1 58. The method of claim 42, wherein the WWAN connection is compliant with a
2 GPRS standard.
- 1 59. The method of claim 42, wherein the WWAN connection is compatible with
2 access via Metricom.

- 1 60. The method of claim 42, wherein the WWAN connection is made using a
2 cellular telephone network.
- 1 61. The method of claim 42, wherein the WWAN connection is made using an
2 unlicensed 2.4 GHz network.
- 1 62. The method of claim 42, wherein the WWAN connection is made using
2 communication between a satellite and the mobile terminal for at least one
3 direction of the WWAN connection.
- 1 63. The method of claim 42, wherein crossing the disconnect threshold involves
2 the signal quality metric rising above the disconnect threshold.
- 1 64. The method of claim 42, wherein crossing the disconnect threshold involves
2 the signal quality metric dropping below the disconnect threshold.
- 1 65. The method of claim 42, wherein crossing the disconnect threshold involves
2 the signal quality metric reaching the disconnect threshold.
- 1 66. The method of claim 42, wherein the first router controls the WWAN
2 connection and the second router controls the WLAN connection.
- 1 67. The method of claim 42, wherein the first router controls the WLAN
2 connection and the second router controls the WWAN connection.
- 1 68. The method of claim 42, wherein the routing table at the mobile terminal is
2 kept in a system directory file.
- 1 69. The method of claim 42, wherein the routing table at the mobile terminal is
2 kept in a memory.
- 1 70. The method of claim 42, wherein modifying the routing table at the mobile
2 terminal includes update updating the default interface.
- 1 71. The method of claim 42, wherein modifying the routing table at the mobile
2 terminal includes update updating the default IP address.
- 1 72. The method of claim 42, wherein signaling takes place before modifying.

1 73. The method of claim 42, wherein modifying takes place before signaling.

1 74. A method of handing off a session from a WWAN to a WLAN based on
2 signal quality metric, including:

3 monitoring at a mobile terminal, during a session connected to a WWAN, a
4 signal quality metric describing availability of a connection to a WLAN;

5 initiating a connection to a WLAN upon the signal quality metric crossing a
6 connect threshold, while continuing the connection to the WWAN;

7 signaling a first access router to conduct a hand off of the session with a second
8 access router; and

9 modifying routing tables at the mobile terminal to use the WLAN connection to
10 continue the session.

75. The method of claim 74, including further monitoring the signal quality
metric while initiating the connection to the WLAN and determining based upon the
further monitoring whether to proceed with signaling the first access router.

1 76. The method of claim 74, including further monitoring the signal quality
2 metric after initiating the connection to the WLAN and determining based
3 upon the further monitoring whether to proceed with signaling the first access
4 router.

1 77. The method of claim 74, wherein the signal quality metric is a signal to noise
2 ratio.

1 78. The method of claim 74, wherein the signal quality metric is a bit error rate.

1 79. The method of claim 74, wherein the signal quality metric is a packet loss
2 rate.

1 80. The method of claim 74, wherein the signal quality metric is a frame loss rate.

1 81. The method of claim 74, wherein the signal quality metric is a measure of
2 network congestion.

- 1 82. The method of claim 74, wherein the signal quality metric is a measure of
2 network transmission delay.
- 1 83. The method of claim 74, wherein the WLAN connection is compliant with
2 any 802.11x standard.
- 1 84. The method of claim 74, wherein the WLAN connection is made using an
2 unlicensed 2.4 GHz network.
- 1 85. The method of claim 74, wherein the session is a TCP session.
- 1 86. The method of claim 74, wherein the session is a UDP session.
- 1 87. The method of claim 74, wherein the connection to the WWAN is a PPP
2 connection.
- 1 88. The method of claim 74, wherein the WWAN connection is compliant with
2 an IS 95b standard.
- 1 89. The method of claim 74, wherein the WWAN connection is compliant with
2 an enhanced GSM standard.
- 1 90. The method of claim 74, wherein the WWAN connection is compliant with a
2 GPRS standard.
- 1 91. The method of claim 74, wherein the WWAN connection is compatible with
2 access via Metricom.
- 1 92. The method of claim 74, wherein the WWAN connection is made using a
2 cellular telephone network.
- 1 93. The method of claim 74, wherein the WWAN connection is made using an
2 unlicensed 2.4 GHz network.
- 1 94. The method of claim 74, wherein the WWAN connection is made using
2 communication between a satellite and the mobile terminal for at least one
3 direction of the WWAN connection.

- 1 95. The method of claim 74, wherein crossing the connect threshold involves the
2 signal quality metric rising above the connect threshold.
- 1 96. The method of claim 74, wherein crossing the connect threshold involves the
2 signal quality metric dropping below the connect threshold.
- 1 97. The method of claim 74, wherein crossing the connect threshold involves the
2 signal quality metric reaching the connect threshold.
- 1 98. The method of claim 74, wherein the first router controls the WWAN
2 connection and the second router controls the WLAN connection.
- 1 99. The method of claim 74, wherein the first router controls the WLAN
2 connection and the second router controls the WWAN connection.
- 1 100. The method of claim 74, wherein the routing table at the mobile terminal is
2 kept in a system directory file.
- 1 101. The method of claim 74, wherein the routing table at the mobile terminal is
2 kept in a memory.
- 1 102. The method of claim 74, wherein modifying the routing table at the mobile
2 terminal includes update updating the default interface.
- 1 103. The method of claim 74, wherein modifying the routing table at the mobile
2 terminal includes update updating the default IP address.
- 1 104. The method of claim 74, wherein signaling takes place before modifying.
- 1 105. The method of claim 74, wherein modifying takes place before signaling.
- 1 106. A method of handing off a wireless session from a relatively high
2 bandwidth wireless connection to a relatively low bandwidth connection based on a
3 signal quality metric, including:
4 monitoring at a mobile terminal during a wireless session a signal quality metric
5 describing a relatively high bandwidth connection;

6 initiating a connection to a relatively low bandwidth connection upon the signal
 7 quality metric crossing a disconnect threshold, while continuing the relatively
 8 high bandwidth connection;
 9 signaling a first access router to conduct a hand off of the session with a second
 10 access router; and
 11 modifying routing tables at the mobile terminal to use the relatively low
 12 bandwidth connection to continue the session.

107. The method of claim 106, including further monitoring the signal
 quality metric while initiating the connection to the relatively low bandwidth
 15 connection and determining based upon the further monitoring whether to proceed
 with signaling the first access router.

1 108. The method of claim 106, including further monitoring the signal quality
 2 metric after initiating the connection to the relatively low bandwidth
 3 connection and determining based upon the further monitoring whether to
 4 proceed with signaling the first access router.

1 109. The method of claim 106, wherein the signal quality metric is a signal to
 2 noise ratio.

1 110. The method of claim 106, wherein the signal quality metric is a bit error rate.

1 111. The method of claim 106, wherein the signal quality metric is a packet loss
 2 rate.

1 112. The method of claim 106, wherein the signal quality metric is a frame loss
 2 rate.

1 113. The method of claim 106, wherein the signal quality metric is a measure of
 2 network congestion.

1 114. The method of claim 106, wherein the signal quality metric is a measure of
 2 network transmission delay.

1 115. The method of claim 106, wherein the relatively high bandwidth connection
2 is compliant with any 802.11x standard.

1 116. The method of claim 106, wherein the relatively high bandwidth connection
2 is made using an unlicensed 2.4 GHz network.

1 117. The method of claim 106, wherein the relatively high bandwidth connection
2 is a PPP connection.

1 118. The method of claim 106, wherein the session is a TCP session.

1 119. The method of claim 106, wherein the session is a UDP session.

1 120. The method of claim 106, wherein the relatively low bandwidth connection is
2 a PPP connection.

1 121. The method of claim 106, wherein the relatively low bandwidth connection is
2 compliant with an IS 95b standard.

1 122. The method of claim 106, wherein the relatively low bandwidth connection is
2 compliant with an enhanced GSM standard.

1 123. The method of claim 106, wherein the relatively low bandwidth connection is
2 compliant with a GPRS standard.

1 124. The method of claim 106, wherein the relatively low bandwidth connection is
2 compatible with access via Metricom.

1 125. The method of claim 106, wherein the relatively low bandwidth connection is
2 made using a cellular telephone network.

1 126. The method of claim 106, wherein the relatively low bandwidth connection is
2 made using an unlicensed 2.4 GHz network.

1 127. The method of claim 106, wherein the relatively low bandwidth connection is
2 made using communication between a satellite and the mobile terminal for at
3 least one direction of the relatively low bandwidth connection.

1 128. The method of claim 106, wherein crossing the disconnect threshold involves
2 the signal quality metric rising above the disconnect threshold.

1 129. The method of claim 106, wherein crossing the disconnect threshold involves
2 the signal quality metric dropping below the disconnect threshold.

1 130. The method of claim 106, wherein crossing the disconnect threshold involves
2 the signal quality metric reaching the disconnect threshold.

1 131. The method of claim 106, wherein the first router controls the relatively low
2 bandwidth connection and the second router controls the relatively high
3 bandwidth connection.

1 132. The method of claim 106, wherein the first router controls the relatively high
2 bandwidth connection and the second router controls the relatively low
3 bandwidth connection.

1 133. The method of claim 106, wherein the routing table at the mobile terminal is
2 kept in a system directory file.

1 134. The method of claim 106, wherein the routing table at the mobile terminal is
2 kept in a memory.

1 135. The method of claim 106, wherein modifying the routing table at the mobile
2 terminal includes update updating the default interface.

1 136. The method of claim 106, wherein modifying the routing table at the mobile
2 terminal includes update updating the default IP address.

1 137. The method of claim 106, wherein signaling takes place before modifying.

1 138. The method of claim 106, wherein modifying takes place before signaling.

1 139. A method of handing off a wireless session from a relatively low
2 bandwidth wireless connection to a relatively high bandwidth connection based on a
3 signal quality metric, including:

4 monitoring at a mobile terminal during a wireless session a signal quality metric
5 describing availability of a relatively high bandwidth connection;

initiating a connection to a relatively high bandwidth connection upon the signal quality metric crossing a connect threshold, while continuing the relatively low bandwidth connection;

signaling a first access router to conduct a hand off of the session with a second access router; and

modifying routing tables at the mobile terminal to use the relatively high bandwidth connection to continue the session.

140. The method of claim 139, including further monitoring the signal quality metric while initiating the connection to the relatively high bandwidth connection and determining based upon the further monitoring whether to proceed with signaling the first access router.

141. The method of claim 139, including further monitoring the signal quality metric after initiating the connection to the relatively high bandwidth connection and determining based upon the further monitoring whether to proceed with signaling the first access router.

142. The method of claim 139, wherein the signal quality metric is a signal to noise ratio.

143. The method of claim 139, wherein the signal quality metric is a bit error rate.

144. The method of claim 139, wherein the signal quality metric is a packet loss rate.

145. The method of claim 139, wherein the signal quality metric is a frame loss rate.

146. The method of claim 139, wherein the signal quality metric is a measure of network congestion.

147. The method of claim 139, wherein the signal quality metric is a measure of network transmission delay.

1 148. The method of claim 139, wherein the relatively high bandwidth connection
2 is compliant with any 802.11x standard.

1 149. The method of claim 139, wherein the relatively high bandwidth connection
2 is made using an unlicensed 2.4 GHz network.

1 150. The method of claim 139, wherein the relatively high bandwidth connection
2 is a PPP connection.

1 151. The method of claim 139, wherein the session is a TCP session.

1 152. The method of claim 139, wherein the session is a UDP session.

1 153. The method of claim 139, wherein the relatively low bandwidth connection is
2 a PPP connection.

1 154. The method of claim 139, wherein the relatively low bandwidth connection is
2 compliant with an IS 95b standard.

1 155. The method of claim 139, wherein the relatively low bandwidth connection is
2 compliant with an enhanced GSM standard.

1 156. The method of claim 139, wherein the relatively low bandwidth connection is
2 compliant with a GPRS standard.

1 157. The method of claim 139, wherein the relatively low bandwidth connection is
2 compatible with access via Metricom.

1 158. The method of claim 139, wherein the relatively low bandwidth connection is
2 made using a cellular telephone network.

1 159. The method of claim 139, wherein the relatively low bandwidth connection is
2 made using an unlicensed 2.4 GHz network.

1 160. The method of claim 139, wherein the relatively low bandwidth connection is
2 made using communication between a satellite and the mobile terminal for at
3 least one direction of the relatively low bandwidth connection.

- 1 161. The method of claim 139, wherein crossing the connect threshold involves
2 the signal quality metric rising above the connect threshold.
- 1 162. The method of claim 139, wherein crossing the connect threshold involves
2 the signal quality metric dropping below the connect threshold.
- 1 163. The method of claim 139, wherein crossing the connect threshold involves
2 the signal quality metric reaching the connect threshold.
- 1 164. The method of claim 139, wherein the first router controls the relatively low
2 bandwidth connection and the second router controls the relatively high
3 bandwidth connection.
- 1 165. The method of claim 139, wherein the first router controls the relatively high
2 bandwidth connection and the second router controls the relatively low
3 bandwidth connection.
- 1 166. The method of claim 139, wherein the routing table at the mobile terminal is
2 kept in a system directory file.
- 1 167. The method of claim 139, wherein the routing table at the mobile terminal is
2 kept in a memory.
- 1 168. The method of claim 139, wherein modifying the routing table at the mobile
2 terminal includes update updating the default interface.
- 1 169. The method of claim 139, wherein modifying the routing table at the mobile
2 terminal includes update updating the default IP address.
- 1 170. The method of claim 139, wherein signaling takes place before modifying.
- 1 171. The method of claim 139, wherein modifying takes place before signaling.